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09/541,354	03/31/2000	Raphael Yair	32-NM-5321	3181

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Patrick S Yoder
7915 FM 1960 West Suite 330
Houston, TX 77070

EXAMINER
FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
2862	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/541,354	Raphael Yair et al.,
Examiner	**Art Unit**
Tiffany Fetzner	2862

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Dec 16, 2002*.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-3, 5-23, and 25-28* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-3, 5-23, and 25-28* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED Non-Final ACTION

1. The examiner notes that **claims 4 and 24 are canceled** as per applicant's April 3rd 2002 response.

Drawings

2. The objection to Figure 8 is rescinded in view of applicant's remarks on page 6 paragraph 1 of the April 3rd 2002 response.

3. ***Response to Arguments***

4. Applicant's arguments with respect to **claims 1-3, 5-23,** and **25-28** from the December 16th 2002 amendment response have been considered but are moot in view of the new ground(s) of rejection.

5. The rejection of all claims with respect to the **Wirth et al.**, reference US patent 5,270,657 issued December 14th 1993; are **rescinded** in view of applicant's arguments in the December 16th 2002 response; due to the change of applied art the following rejection is non-final.

6. ***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for

purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. **Claim 1,** is rejected under **35 U.S.C. 102(b)** as being anticipated by **Macovski et al.**, US patent 5,835,995 issued November 10th 1998, filed October 28th 1996.

9. With respect to **Twice Amended Claim 1, Macovski et al.**, teaches, shows, and / or suggests "A switching circuit" [See Figures 3, where the switching circuit is considered to comprise switch/diode components 26, components 25, 22, and components 23, 24, and 21 taken as a combination together] "to linearly conduct current between a source" [See Figures 3 power supply 20]"and a load" [See Figure 3, component 11] **Macovski et al.**, teaches, shows, and / or suggests that "the circuit comprising: a switching device" [See Figure 3 switch component 26, and / or components 23, 24, and 21 taken as a combination together] "coupled between the source and the load", [See Figure 3]. **Macovski et al.**, also teaches, shows, and / or suggests that the switching device having a conductive state in which a first portion of the current is conducted between the source and the load during a first phase of operation, (i.e. the ramp up interval)"the first phase of operation dependent on the magnitude of the current;" [See col. 4 line 1 through col. 6 line 11] "and a current steering circuit" [See Figure 4 and col. 4 lines 29-55 especially col. 4 lines 34-37 where **Macovski et al.**, explicitly teaches replacing component 25 in Figure 3 with the circuitry of Figure 4. The examiner notes that by making this substitution the **Macovski et al.**, reference suggests applicant's claimed circuit, because with this configuration the "steering circuit" (i.e. the components of Figure 4) are "coupled between the source" (i.e. component 20 of Figure 3) "and the load" (i.e. component 11 of figure 3) "and in parallel with the switching

device", [See Figures 3 and 4 in combination] Additionally, **Macovski et al.**, teaches, shows, and / or suggests that "the current steering circuit" (i.e. the circuitry of Figure 4) "has a conductive state in which a second portion of the current is conducted between the source and the load during a second phase of operation" (i.e. the down ramping) "in which the magnitude of the current is below a non-zero threshold value." [See **Macovski et al.**, col. 4 line 1 through col. 6 line 11].

10. **Claims 1, 2, 3, 5, 6, 10-13, 18, 23, 25** and **28** are rejected under **35 U.S.C. 102(e)** as being anticipated by **Van Groningen**, US patent 6,140,873 issued October 31st 2000 with an effective filing date of July 28th 1999.

11. With respect to **Twice Amended Claim 1, Van Groningen**, teaches, shows, and / or suggests "A switching circuit" [See Figures 2, components 34-1, 34-2 through component 34-n; col. 6 line 1 through col. 7 line 15; Figure 3 switch components 36, 38, with diodes 40, 42, and capacitors 52, 54, and Figure 4 switch components 100-106, with diodes 110-116, and capacitors 120-126] "to linearly conduct current between a source" [See Figures 2, 3 and 4 component 50] "and a load" [See Figures 2 3, and 4 component 70; col. 6 line 1 through col. 8 line 58] **Van Groningen**, teaches, shows, and / or suggests that "the circuit comprising: a switching device" [See the switching IGBT type power transistors, or thyristors components 36, 38, in Figures 2; col. 6 lines 1-31] "coupled between the source and the load", [See Figures 2, 3, and 4]. **Van Groningen**, also teaches, shows, and / or suggests that the switching device having a conductive state in which a first portion of the current is conducted between the source and the load during a first phase of operation, the first phase of operation dependent on the magnitude of the current;"

[See abstract, col. 2 line 62 through col. 5 line 10; col. 5 line 29 through col. 11 line 8] "and a current steering circuit" [See Figure 2 components 60-2 with 64-2; or 60-3 with 64-3; or 60-1 with 64-1; Figure 3 circuit 72; Figure 4 circuit 80] "coupled between the source" (i.e. component 50) "and the load" (i.e. component 70) "and in parallel with the switching device", [See Figure 2] Additionally, **Van Groningen**, teaches, shows, and / or suggests that "the current steering circuit has a conductive state in which a second portion of the current is conducted between the source and the load during a second phase of operation in which the magnitude of the current is below a non-zero threshold value." [See abstract, col. 2 line 62 through col. 5 line 10; col. 5 line 29 through col. 11 line 8]

12. With respect to **Amended Claim 10, Van Groningen**, teaches, shows, and / or suggests "A magnetic resonance imaging. (MRI) system to perform an MRI scan in accordance with a pulse sequence, the pulse sequence including at least a first pulse" [See col. 5 lines 29-48 where rf coil 9 serves to generate at least one alternating magnetic field, (i.e. the alternating magnetic field produced by coil 9 is considered by the examiner to be an equivalent term for an RF pulse). Additionally central control device 17 controls modulator 19 for rf source 11, with modulator 19 also controlled by RF oscillator 23 and these components are used to generate MRI pulse sequences; [See also col. 1 lines 18-29]]. **Van Groningen**, also teaches, shows, and / or suggests the "the system comprising: a gradient coil assembly to generate a gradient magnetic field during the MRI scan;" [See Figure 1 component 3 which shows the gradient coil system; col. 2 line 62 through col. 5 line 10; and col. 5 line 29 through col. 11 line 8] "an amplifier to drive the gradient coil assembly such that the gradient coil assembly generates the gradient magnetic field in

accordance with the pulse sequence" [See Figures 1, 2 component 7; col. 5 line 29 through col. 11 line 8]

13. The limitations of "a switch assembly to provide a conductive path between the amplifier and the gradient coil assembly, the switch assembly comprising: a first switching device having a conductive state during a first portion of the first pulse of the pulse sequence; and a second switching device coupled in parallel with the first switching device, the second switching device having a conductive state during a second portion of the first pulse of the pulse sequence during which a current from the amplifier to the gradient coil assembly is below a non-zero threshold value" are taught suggested and shown by **Van Groningen**, for the same reasons given in the rejection of claim 1, which need not be reiterated. Additionally, **Van Groningen**, teaches and suggests that "the conductive path is provided between the amplifier and the gradient coil assembly during substantially the entire duration of the first pulse." [See col. 2 line 62 through col. 11 line 8; especially col. 3 line 62 through col. 5 line 10.] The same reasons for rejection, that apply to **claim 1,** also apply to **claim 10**.

14. With respect to **Amended Claim 18,** and corresponding method **claim 23, Van Groningen**, suggests and shows "A magnetic resonance imaging (MRI) system for acquiring MRI data, the system comprising: a processor" (central control device 17) "to control acquisition of the MRI data in accordance with a program stored in a memory, the program including an imaging protocol having a sequence of gradient pulses and a sequence of detection pulses" [See abstract, Figure 1, col. 2 line 62 through col. 11 line 8.] **Van Groningen**, also teaches, suggests and shows "a gradient amplifier to drive the gradient coil assembly in accordance with the

sequence of gradient pulses;" [See Figures 1, 2 component 7; col. 5 line 29 through col. 11 line 8] "an MRI scanner to perform an MRI scan in accordance with the stored imaging protocol", [See Figure 1, col. 5 lines 29-65; and col. 2 line 62 through col. 11 line 8 as **Van Groningen**, invention is taught and described in connection with an MRI apparatus.] **Van Groningen**, shows and suggests that "the MRI scanner comprising a magnet; a gradient coil assembly, and an RF coil assembly" [See Figure 1, col. 5 lines 29-65] **Van Groningen**, also teaches, suggests and shows "an RF detector coupled to the RF coil to detect MRI data resulting from the MRI scan in accordance with the sequence of detection pulses" [See Figure 1 col. 2 line 62 through col. 11 line 8]

15. The limitations of a "gradient coil assembly generating a gradient magnetic field in accordance with the sequence of pulses; a switch assembly coupled between the gradient amplifier and the gradient coil assembly to provide a conductive path therebetween, the switch assembly comprising: a first switching device having a conductive state during a first portion of a first gradient pulse; and a second switching device coupled in parallel with the first switching device, the second switching device having a conductive state during a second portion of the first gradient pulse during which a current from the amplifier to the gradient coil assembly is below a non-zero threshold value, wherein the conductive path is provided between the gradient amplifier and the gradient coil assembly during substantially the entire duration of the first pulse;" are taught suggested and shown by **Van Groningen**, for the same reasons given in the rejection of claims 1, and 10, which need not be reiterated. The same reasons for rejection, that apply to **claims 1,** and **10** also apply to **claim 18,** and **corresponding method claim 23**.

16. With respect to **Claim 2**, **Van Groningen**, teaches and suggests that "the switching device" (i.e. IGBT type controllable switch components 36 and 38) "are in a non-conductive state during the second phase of operation." [See col. 8 line 37 trough col. 11 line 8; Figures 1, 2, 3, and 4, where the numerous component arrangements for switching to occur from conductive to non-conductive states, or non-conductive to conductive states are explained in detail.] The examiner notes that "on" or "off" suggest conduction or non-conduction as taught in the reference.] The same reasons for rejection, that apply to **claim 1** also apply to **claim 2**.

17. With respect to **Claim 3**, **Van Groningen**, teaches, shows and suggests that "the current steering circuit" [See Figure 2 components 60-2 with 64-2; or 60-3 with 64-3; or 60-1 with 64-1; col. 6 line 44 through col. 7 line 22; Figure 3 circuit 72; col. 7 line 23 through col. 9 line 41; Figure 4 circuit 82; col. 9 line 42 through col. 11 line 8] "is in a non-conductive state during at least one phase of operation." [See col. 5 line 66 through col. 11 line 8, where the numerous component arrangements for switching to occur from conductive to non-conductive states, or non-conductive to conductive states are explained in detail.] The same reasons for rejection, that apply to **claim 1** also apply to **claim 3**.

18. With respect to **Claim 5**, **Van Groningen**, teaches and suggests that "the second phase of operation occurs when the switching device" [See components 36 and 38 in Figure 2] "transitions from the conductive state to a non-conductive state." [See col. 5 line 66 through col. 11 line 8, where the numerous component arrangements for switching to occur from conductive to non-conductive states, or non-conductive to conductive states are explained in detail.] The

same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 2** also apply to **claim 5**.

19. With respect to **Claim 6**, **Van Groningen**, teaches and suggests that "the switching device" [See components 36i-n and 38i-n in Figure 2] "transitions from the conductive state to a non-conductive state when the absolute value of the magnitude of the current falls below a non-zero threshold value." [See situation II col. 8 line 36 through col. 9 line 14] The same reasons for rejection, that apply to **claim 1** also apply to **claim 6**.

20. With respect to **Claim 11**, **Van Groningen**, teaches and suggests that "the first portion of the first pulse of the pulse sequence" (i.e. the rise time) "is dependent on the magnitude of current conducted through the first switching device." [See Figures 1, 2, 3, 4, col. 1 lines 13-55 where current pulse having a rise time magnitude of 0.2 ms and a pulse length of 1-10ms are taught, and situation II col. 8 line 36 through col. 9 line 14] The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 5, 6,** and **10** also apply to **claim 11**.

21. With respect to **Claim 12**, the examiner notes that this limitation is already an aspect of independent claim 10, therefore **Van Groningen**, teaches, and suggests that "the second portion of the first pulse occurs when the magnitude of the current conducted through the first switching device reaches a non-zero threshold value", for the same rejection reasons given in the rejection of **claim 10** that need not be reiterated. Additionally, See situation II col. 8 line 36 through col. 9 line 14. The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 5, 6, 10** and **11** also apply to **claim 12**.

22. With respect to **Claim 13**, the **Van Groningen**, reference shows and suggests that the "first switching device and the second switching device are uni-directional current-conducting devices, each of the first and second switching devices conducting current in the same direction.[See Figures 1-4 components 38i-38n which conduct current in the same direction; or components 36i-36n which conduct current in the same direction; or their corresponding transistor components in Figures 3 and 4; or the IGBT taught in col. 6 lines 9-13; or the transistors which are connected in series, such that a current through the transistor components, is directed in one direction.] The **Van Groningen**, reference teaches and suggests that the conductive direction is "between the amplifier and the gradient coil assembly", as mentioned in the rejection of **claim 10**, and taught in col. 5 line 66 through col. 6 line 17. The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 4, 5, 6,** and **10** also apply to **claim 13**.

23. With respect to **Claim 25**, This claim is just the method version of **claims 1, 5, 10,** and **18** combined. Therefore, The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 4, 10, 18,** and **23** also apply to **claim 24** and need not be reiterated.

24. With respect to **Claim 28**, The **Van Groningen**, reference teaches and suggests "generating MRI data as a result of the MRI scan; and detecting the MRI data" [See col. 5 lines 29-48] The same reasons for rejection, that apply to **claims 1, 10, 18,** and **23** also apply to **claim 28** and need not be reiterated.

25. ***Claim Rejections - 35 USC § 103***

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

27. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

28. **Claims 7, 8, 9, 14, 15, 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Van Groningen**, US patent 6,140,873 issued October 31st 2000 with an effective filing date of July 28th 1999; in view of alternatively **Mansfield et al.**, US patent 4,820,986 issued April 11th 1989; or **Macovski et al.**, US patent 5,835,995 issued November 10th 1998; filed October 28th 1996.

29. With respect to **Claim 7**, **corresponding claim 14** which depends from **independent claim 10** and **corresponding claim 19** which depends from **independent claim 18; Van Groningen**, lacks directly teaching that "the switching device comprises a silicon controlled rectifier (SCR)." However, **Mansfield et al.**, teaches that in an MRI apparatus with four switches that are each shunted by diodes so that current can flow in either direction through a coil

depending on the setting of the switches, that the switches can be FET's, SCR's, bidirectional solid-state devices or bidirectional mechanical devices. [See col. 7 lines 14-20; col. 7 lines 55-60; col. 1 lines 4-30; the abstract] Additionally, **Macovski et al.**, teaches and suggests that "the switching device comprises a silicon controlled rectifier (SCR)." because **Macovski et al.**, teaches that the switches of Figures 3 and 4 in reality are electronic switches such as SCR's (silicon controlled rectifiers), thyristors or comparable high power devices that are actuated by a pre-set computer program as in all MRI systems used today. [See col. 4 lines 50-55; col. 5 lines 4-19 and Figures 3-5]

30. It would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the silicon controlled rectifiers (SCR)'s of **Mansfield et al.**, or **Macovski et al.**, can be used with the gradient amplifier of **Van Groningen**, because the **Van Groningen**, apparatus shows, teaches and suggests that the multiple switches (i.e. shown in Figures 2, 3, and 4 of **Van Groningen**,) are controllable electronically by central control device 17 of figure 1. [See col. 5 lines 42-46 with each switch shunted by a diodes so that current flows in a direction which depends on the setting of the switches. [See **Van Groningen**, Figures 2, 3, 4, col. 5 line 29 through col. 11 line 17], Therefore the substitution of the SCR switches is an obvious modification to the **Van Groningen**, reference which is directly suggested from the use of the silicon controlled rectifier switches, that are computer controlled in the **Macovski et al.**, reference, or controlled by the state of the switches as in the **Mansfield et al.**, reference. The ability and motivation to combine these references comes from the fact that both references concern the ability to control the current and magnetic gradients, in NMR and MRI systems; and

both references use the same basic configuration, to address and control the highly switched current required in an NMR / MRI system. The same reasons for rejection, that apply to **claims 1, 10, 18,** also apply to **claims 7, 14, 19**.

31. With respect to **Claim 8**, and **corresponding claim 15** which depends from **independent claim 10, Van Groningen**, teaches, shows and suggests that the "steering circuit comprises a transistor to conduct the current during the second phase of operation." [See Figures 2, 3, 4 and col. 5 line 29 through col. 9 line 20.] The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 7, 10** also apply to **claims 8, 15**.

32. With respect to **Claim 9**, **Van Groningen**, suggests and shows that the "switching device comprises a pair of anti-parallel" transistors [See Figures 2, 3, and 4] As was explained in the rejection of **claim 7**, **Mansfield et al.**, and **Macovski et al.**, teach and suggest the ability to substitute "silicon controlled rectifiers", for the transistor switch components in an MRI circuit configuration. [See the rejection of claim 7] Therefore, applicant's claimed limitation is taught and suggested from the teachings of **Van Groningen**, in combination with the teachings of **Mansfield et al.**, or **Macovski et al.** The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 7** also apply to **claim 9**.

33. **Claims 16, 20,** and **26** are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Van Groningen**, US patent 6,140,873 issued October 31st 2000 with an effective filing date of July 28th 1999; or alternatively in view of **Vavrek et al.,** US patent 5,311,135 issued May 10th 1994.

34. With respect to **Claim 16**, **corresponding system claim 20** which depends from **independent claim 18** and **corresponding method claim 26** which depends from **independent claim 23; Van Groningen**, suggests and shows that "the switching assembly comprises: a third switching device" (i.e. a diode such as component 40-i through 40-n; or 42-i through 42-n) coupled in parallel with the first switching device" [See Figure 2] "the third switching device having a conductive state during a first portion of a second pulse of the pulse sequence, the second pulse having a polarity opposite of the first pulse;" [See Figures 2, 3, 4 and col. 5 line 29 through col. 9 line 20. The examiner notes that the current changing from positive to negative is suggestive of a change in polarity] "and a fourth switching device" (i.e. a capacitor such as component 54-i through 54-n; or 52-i through 52-n) "coupled in parallel with the third switching device", [See Figure 2] "the second switching device having a conductive state during a second portion of the second pulse of the pulse sequence, such that the conductive path is provided between the amplifier and the gradient coil assembly during substantially the entire duration of the second pulse." [See Figures 2, 3, 4 and col. 5 line 29 through col. 9 line 20]

35. Additionally **Vavrek et al.,** shows in Figures 3 and 9 an MRI gradient coil switching device circuit, that meets the criteria set forth by applicant. [See Figures 3, 9 and the teachings of the **Vavrek et al.,** references concerning Figures 3 and 9] The examiner notes that the entire **Vavrek et al.,** reference is applicable because the invention of **Vavrek et al.,** is a way to couple and decouple multiple MRI gradient field coils or sets of coils, which must be switched in the course of an MRI pulse sequence, and is one of applicant's main concerns. Additionally, since the **Vavrek et al.,** reference is directed toward enabling and disabling at least two sets of two

gradient coils, which must be switched, and the **Van Groningen**, reference is concerned with the effective switching, of the gradient power amplifier which supplies power to the gradient coils of the MRI device, it would have been obvious to one of ordinary skill in the art, at the time that the invention was made, that modifying the switches of the **Vavrek et al.,** reference, to include the switches of **Van Groningen**, is desirable because the switches of **Van Groningen**, preserve the natural efficiency of the low voltage power supply. [See abstract col. 1 line 8 through col. 11 line 17], and assist in reducing and / or eliminate the potential hazard of electrical voltages and currents that arise from any source in the MRI system, and injuring a patient, which increases the safety of MRI procedures. The same reasons for rejection, that apply to **claims 1, 10, 18, 23** also apply to **claims 16, 20,** and **26**.

36. **Claims 17, 22,** and **27** are rejected under **35 U.S.C. 103(a)** as being unpatentable over **Van Groningen**, US patent 6,140,873 issued October 31st 2000 with an effective filing date of July 28th 1999; in view of **Vavrek et al.,** US patent 5,311,135 issued May 10th 1994.

37. With respect to **Claim 17**, **corresponding system claim 22** which depends from **independent claim 18** and **corresponding method claim 27** which depends from **independent method claim 23;** The **Van Groningen**, reference lacks teaching that teaches that "the gradient coil assembly comprises a first gradient coil set, and a second gradient coil set, and that "the switch assembly selectively couples the amplifier to either the first gradient coil set or the second gradient coil set." However, **Van Groningen**, teaches that the gradient amplifier is associated with supplying the power supply of the gradient coil system 3 shown in Figure 1 [See **Van Groningen**, col. 5 line 66 through col. 6 line 1 with Figures 1 and 2] and the **Vavrek et al.,**

reference, suggests and shows the limitation that "the gradient coil assembly comprises a first gradient coil set, and a second gradient coil set", and that "the switch assembly selectively couples the amplifier to either the first gradient coil set or the second gradient coil set.". [See **Vavrek et al.,** Figures 3, 9, col. 7 lines 36-64]. The same reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 10, 16, 18, 20, 23** and **26** also apply to **claims 17, 22,** and **27** and need not be reiterated.

38. **Claim 21** is rejected under **35 U.S.C. 103(a)** as being unpatentable over **Van Groningen**, US patent 6,140,873 issued October 31st 2000 with an effective filing date of July 28th 1999; in view of **Vavrek et al.,** US patent 5,311,135 issued May 10th 1994 in view of alternatively **Macovski et al.**, US patent 5,835,995 issued November 10th 1998, filed October 28th 1996; or **Mansfield et al.**, US patent 4,820,986 issued April 11th 1989.

39. With respect to **Claim 21**, the **Van Groningen**, reference and the **Vavrek et al.,** reference lack directly teaching that "the first switch device and the third switching device each comprises a silicon controlled rectifier." However, the semi-conductor switches in the **Macovski et al.**, and **Mansfield et al.**, references, as taught in the rejection of **claims 7, 14,** and **19**; suggest that silicon controlled rectifiers can be used for each semi-conductor switch. Therefore, it would have been obvious to one of ordinary skill in the art, at the time that the invention was made that the **Van Groningen**, reference can be modified to enable or disable one or more gradient coils, and that each switch could comprise a silicon controlled rectifier. Therefore, the examiner considers the situation of "the first switch device and the third switching device each comprising a silicon controlled rectifier."to be within the scope of the **Van Groningen**, reference. The same

reasons for rejection, obviousness, and motivation to combine that apply to **claims 1, 7, 10, 14, 18, 19, 20,** and **23**, also apply to **claim 21.**

40. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) **Souza et al.,** US patent 6,144, 205 issued November 7th 2000 filed November 19th 1998.

B) **Schweighofer** US patent 6,034,565 issued March 7th 2000 filed July 21st 1998.

C) **Schweighofer** US patent 6,028,476 issued February 22 2000 filed July 21st 1998.

D) **Ideler** US patent 6,031,422 issued February 29 2000 filed August 4th 1998.

E) **Schweighofer** US patent 6,163,201 issued December 19th 2000 filed March 26th 1998.

F) **Wirth et al.**, US patent 5,270,657 issued December 14th 1993.

Conclusion

41. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is (703) 305-0430. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

42. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz, can be reached on (703) 305-4816. The fax phone number for the organization where this application or proceeding is assigned is (703)305-3432 .

43. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-0956.

Tiffany A. Fujiwara

TAF

February 20, 2003

EDWARD LEFKOWITZ
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800